

What is claimed is:

1. A method for diagnosing faults in a communication network using distributed alarm correlation, said method comprising:

correlating alarm data at a first network node to produce local correlation results; and

replicating diagnostic knowledge to a second network node, said diagnostic knowledge being obtained in response to said local correlation results.
2. The method of claim 1 wherein said correlating alarm data comprises using a generic correlation algorithm to find a root cause of a fault in said network.
3. The method of claim 1 wherein said correlating alarm data comprises using user-defined correlation rules to find a root cause of a fault in said network.
4. The method of claim 1 wherein said diagnostic knowledge comprises a new correlation rule.
5. The method of claim 1 wherein said diagnostic knowledge comprises at least one of a root cause, an alarm definition, and a corrective action.
6. The method of claim 1 wherein said alarm data comprises alarm data generated by network elements in said communication network.

7. The method of claim 1 further comprising reporting said diagnostic knowledge and said local correlation results to a higher-level alarm correlation tool.

8. The method of claim 1 wherein said correlating alarm data comprises correlating said alarm data using topology configuration information stored locally at said first network node.

9. The method of claim 1 wherein said correlating alarm data comprises correlating said alarm data using a local knowledge base at said first network node, said local knowledge base including alarm definitions and correlation rules.

10. A method for diagnosing faults in a communication network using distributed alarm correlation, said method comprising:

receiving alarm data locally at network nodes in said communication network;

correlating said alarm data locally at said network nodes using an associated node-level alarm correlation tool to produce correlation results at each of said network nodes;

reporting said correlation results produced locally at said network nodes to respective users at respective said network nodes;

adding diagnostic knowledge provided by at least one of said users to a local knowledge base at a respective at least one of said network nodes;

replicating said diagnostic knowledge to other said network nodes; and

reporting said diagnostic knowledge and said correlation results produced locally at said network nodes to a higher-level alarm correlation tool.

11. The method of claim 10 further comprising:
reporting said diagnostic knowledge to other said network nodes; and
adding said diagnostic knowledge to a node knowledge base at said other said network nodes.

12. The method of claim 10 further comprising:
receiving said correlation results at said higher-level alarm correlation tool, said correlation results including root causes of faults determined by local alarm correlation at said network nodes;
correlating said root causes determined at said network nodes to find a higher-level root cause at said higher-level alarm correlation tool;
reporting said higher level root cause to a user of said higher-level alarm correlation tool;
and
adding higher-level diagnostic knowledge provided by said user at said higher-level alarm correlation tool to a higher-level knowledge base in said higher-level alarm correlation tool.

13. The method of claim 10 further comprising receiving and storing local topology configuration information at respective said network nodes.

14. A distributed alarm correlation system for diagnosing faults in a communication network, said distributed alarm correlation system comprising:

a plurality of node-level alarm correlation tools located at nodes in said communication network, wherein each of said node-level alarm correlation tools provide node-level alarm correlation to produce node-level correlation results and share diagnostic knowledge with other of said node-level alarm correlation tools at other nodes; and

at least one higher-level management level alarm correlation tool located at a network management center in said communication network, wherein each of said node-level alarm correlation tools shares said diagnostic knowledge and said node-level correlation results with said higher-level management level alarm correlation tool, and wherein said higher-level management level alarm correlation tool provides higher-level alarm correlation to produce higher-level correlation results.

15. The distributed alarm correlation system of claim 14 wherein each of said node-level alarm correlation tools comprises alarm definitions defining alarm groups categorizing alarms generated in said communication network.

16. The distributed alarm correlation system of claim 15 wherein each of said node-level alarm correlation tools comprises correlation rules for determining a root cause in response to alarms received from network elements.

17. The distributed alarm correlation system of claim 16 wherein each of said node-level alarm correlation tools comprises local topology configuration information.

18. The distributed alarm correlation system of claim 14 wherein each of said node-level alarm correlation tools includes a local knowledge base.

19. The distributed alarm correlation system of claim 14 wherein each said higher-level alarm correlation tool includes a higher-level knowledge base.

20. The distributed alarm correlation system of claim 14 wherein each of said node-level alarm correlation tools includes an alarm correlator for correlating network element alarm data with locally stored topology configuration information using user-defined correlation rules.

21. The distributed alarm correlation system of claim 14 wherein each of said node-level alarm correlation tools includes a knowledge replicator for replicating new diagnostic knowledge added by a user.

22. The distributed alarm correlation system of claim 14 wherein each of said node-level alarm correlation tools allows new diagnostic knowledge to be accepted and added at the discretion of a user.

23. A distributed alarm correlation system for diagnosing faults in a communication network, said distributed alarm correlation system comprising:

a plurality of node-level alarm correlators, located at nodes in said communication network, wherein each of said node-level alarm correlators provides node-level alarm correlation

to produce node-level correlation results and share diagnostic knowledge with other of said node-level alarm correlators; and

at least one higher-level management level alarm correlator located at a network management center in said communication network, wherein each of said node-level alarm correlators shares said diagnostic knowledge and said node-level correlation results with said higher-level management level alarm correlator, and wherein said higher-level management level alarm correlator provides higher-level alarm correlation to produce higher-level correlation results.

24. A machine-readable medium whose contents cause a computer system to perform a method of fault diagnosis in a communication network said method comprising:

correlating alarm data at a first network node to produce local correlation results; and
replicating diagnostic knowledge to a second network node, said diagnostic knowledge being obtained in response to said local correlation results.

25. A machine-readable medium whose contents cause a computer system to perform a method of fault diagnosis in a communication network said method comprising:

receiving alarm data locally at network nodes in said communication network;
correlating said alarm data locally at said network nodes using an associated node-level alarm correlation tool to produce correlation results at each of said network nodes;
reporting said correlation results produced locally at said network nodes to respective users at respective said network nodes;

adding diagnostic knowledge provided by at least one of said users to a local knowledge base at a respective at least one of said network nodes;
replicating said diagnostic knowledge to other said network nodes; and
reporting said diagnostic knowledge and said correlation results produced locally at said network nodes to a higher-level alarm correlation tool.

26. The machine-readable medium of claim 24 wherein said method further comprises:

receiving said diagnostic knowledge from said other network nodes;
reporting said diagnostic knowledge received from said other network nodes to said user at said network node; and
or adding said diagnostic knowledge received from said other network nodes to said knowledge base in response to said user.